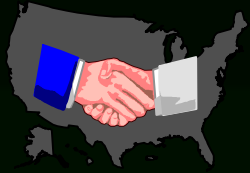


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Toxicity of Hydrogen Peroxide to two lifestages of Cold-, Cool-, and Warmwater Fish

Mark P. Gaikowski
Upper Mississippi Science Center
Biological Resources Division, USGS



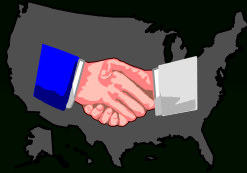
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Objectives

- ◀ Determine the most sensitive representative species to hydrogen peroxide.
- ◀ Determine if life stages are similarly sensitive to hydrogen peroxide.
- ◀ Develop a model to predict mortality at a given treatment concentration and exposure time.



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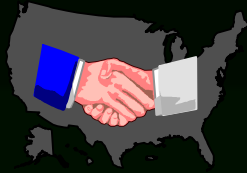
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Methods and Materials

- ◀ Test Chemical
 - ◀ Hydrogen peroxide - 35% Food Grade
Du Pont Chemical Co
- ◀ Verification of treatment concentration
 - ◀ Potassium permanganate titration
 - ◀ Triplicate sample from one aquaria,
single sample from others in
concentration group



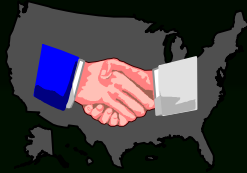


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Range-Finding Exposures

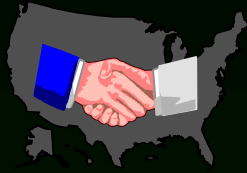
- ◄ Exposure Vessels
 - ◄ 25 L stainless steel - 15 L
- ◄ Static Exposures
 - ◄ Five fish per concentration
 - ◄ 78, 157, 313, 625, and 1250 uL hydrogen peroxide/L
 - ◄ Mortality monitored at 60 and 180 min
- ◄ Determine LC50



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Definitive Exposures

- ◄ Exposure Concentration
 - ◄ High concentration = LC50 (Range-finding)
 - ◄ Lower concentrations = 60% dilution of higher
- ◄ Exposures
 - ◄ 60 or 180 min
 - ◄ Three exposures - Every other day



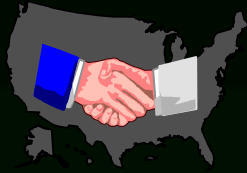
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Definitive Exposures cont.

- ◄ Exposure Vessels
 - ◄ 20 L glass aquaria - 15 \pm 1 L volume
 - ◄ Gravity fed via common head box

- ◄ Test System
 - ◄ Three aquaria per concentration group
 - ◄ Five to eight fish per aquaria
 - ◄ Flow rate - 400 mL/min

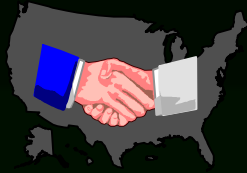


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Exposure Systems



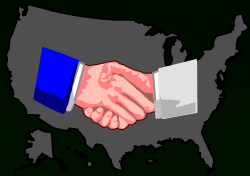


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Methods

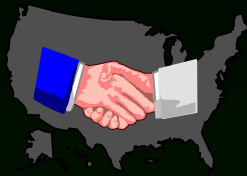




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Species and Lifestages Tested

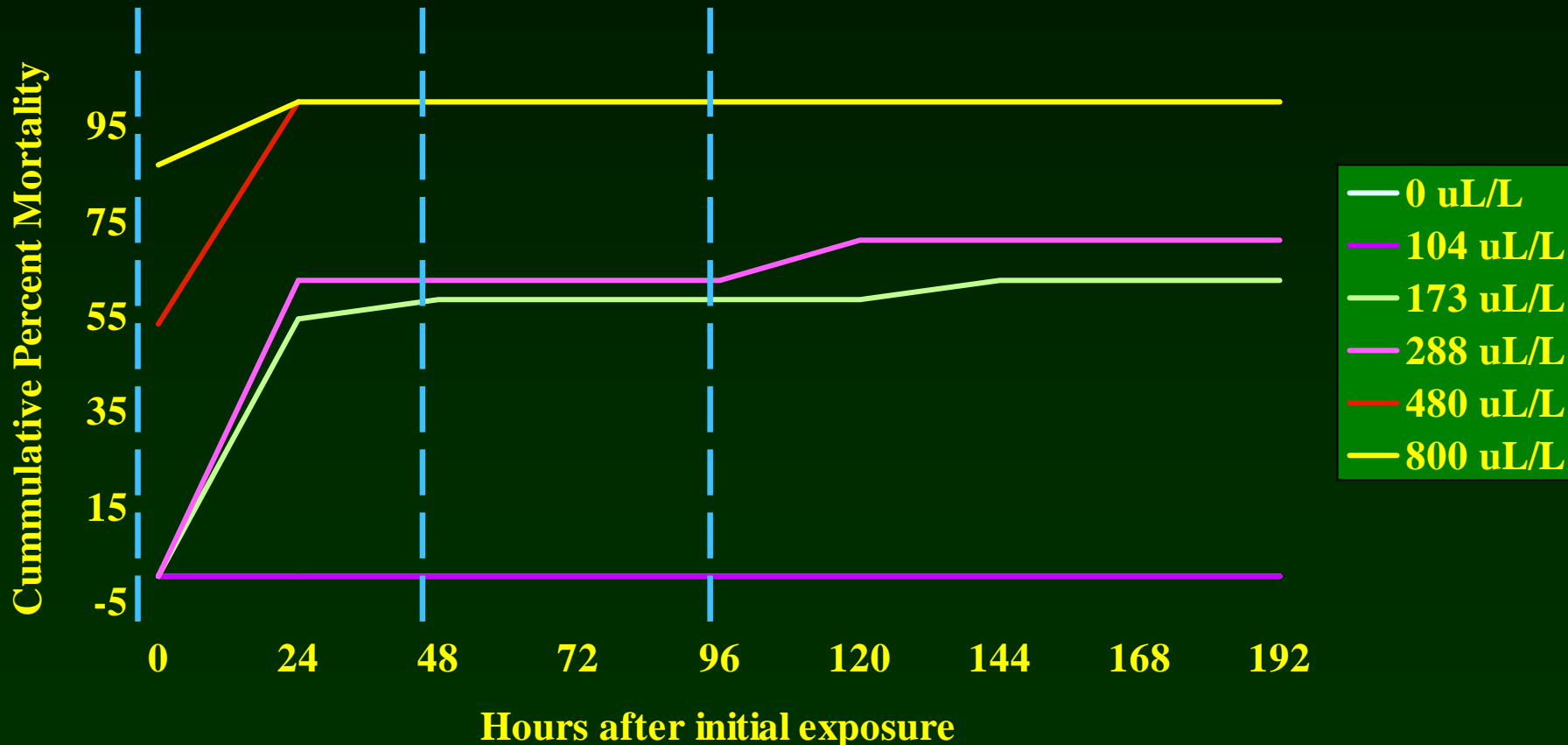
	Life	Stage	Test
Species	Fry	Fingerling	Temperature
Atlantic salmon	-	X	12
Bluegill	X	X	22, 22
Channel catfish	X	X	22, 22
Fathead minnow	X	X	22, 22
Lake trout	-	X	12
Largemouth bass	X	X	22, 22
Muskellunge	X	X	17, 17
Northern pike	X	X	12, 17
Paddlefish	-	X	22
Pallid sturgeon	X	X	17, 17
Rainbow trout	X	X	12, 12
Walleye	X	X	17, 17
White sucker	X	X	22, 17
Yellow perch	X	X	22, 22



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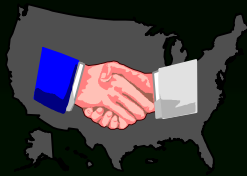
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Results - Muskellunge Fry



mean weight - 0.43 g/fish

mean TL - 50 mm

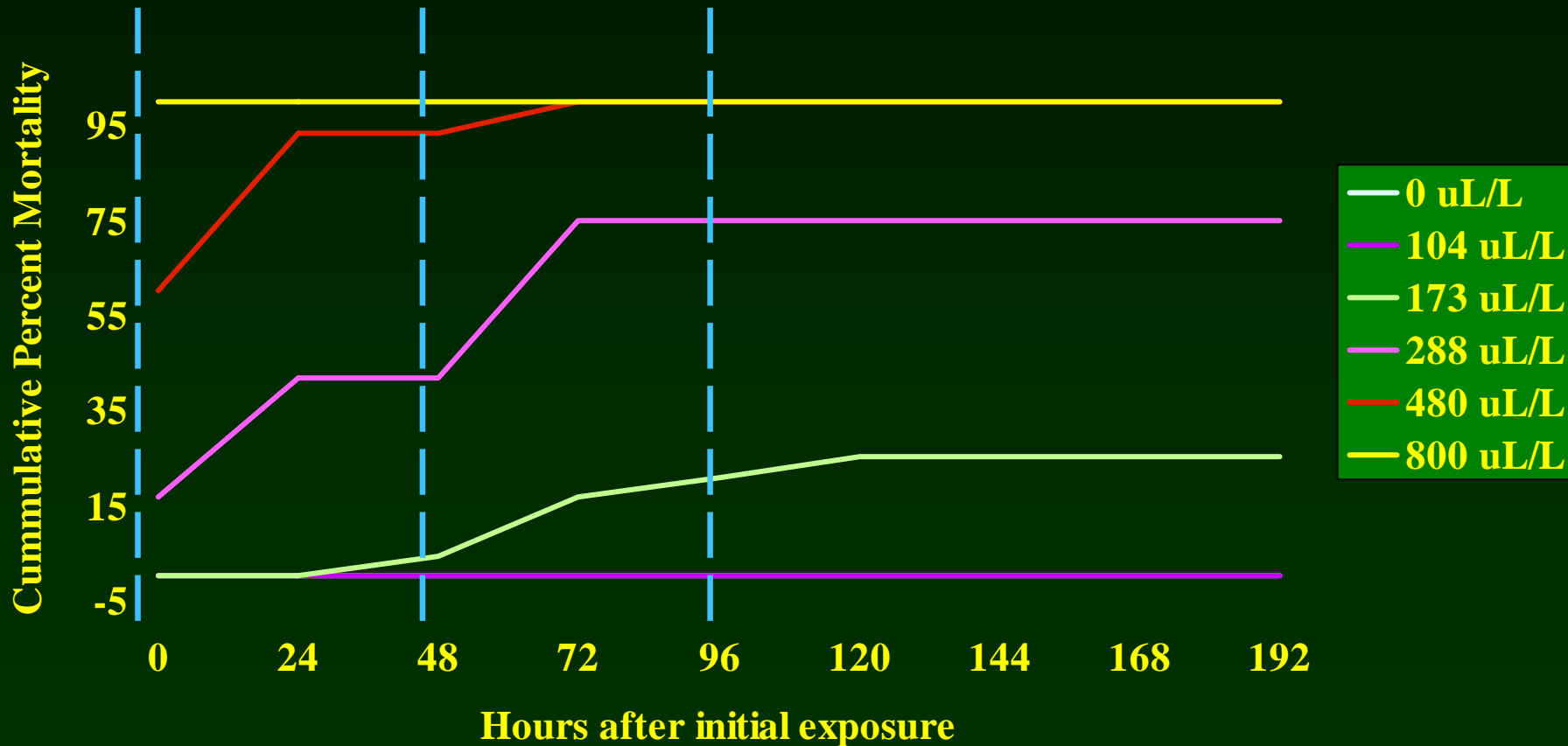


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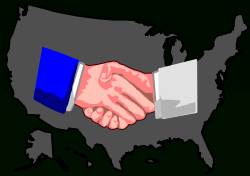


Results - Muskellunge Fingerling



mean weight - 31.7 g/fish

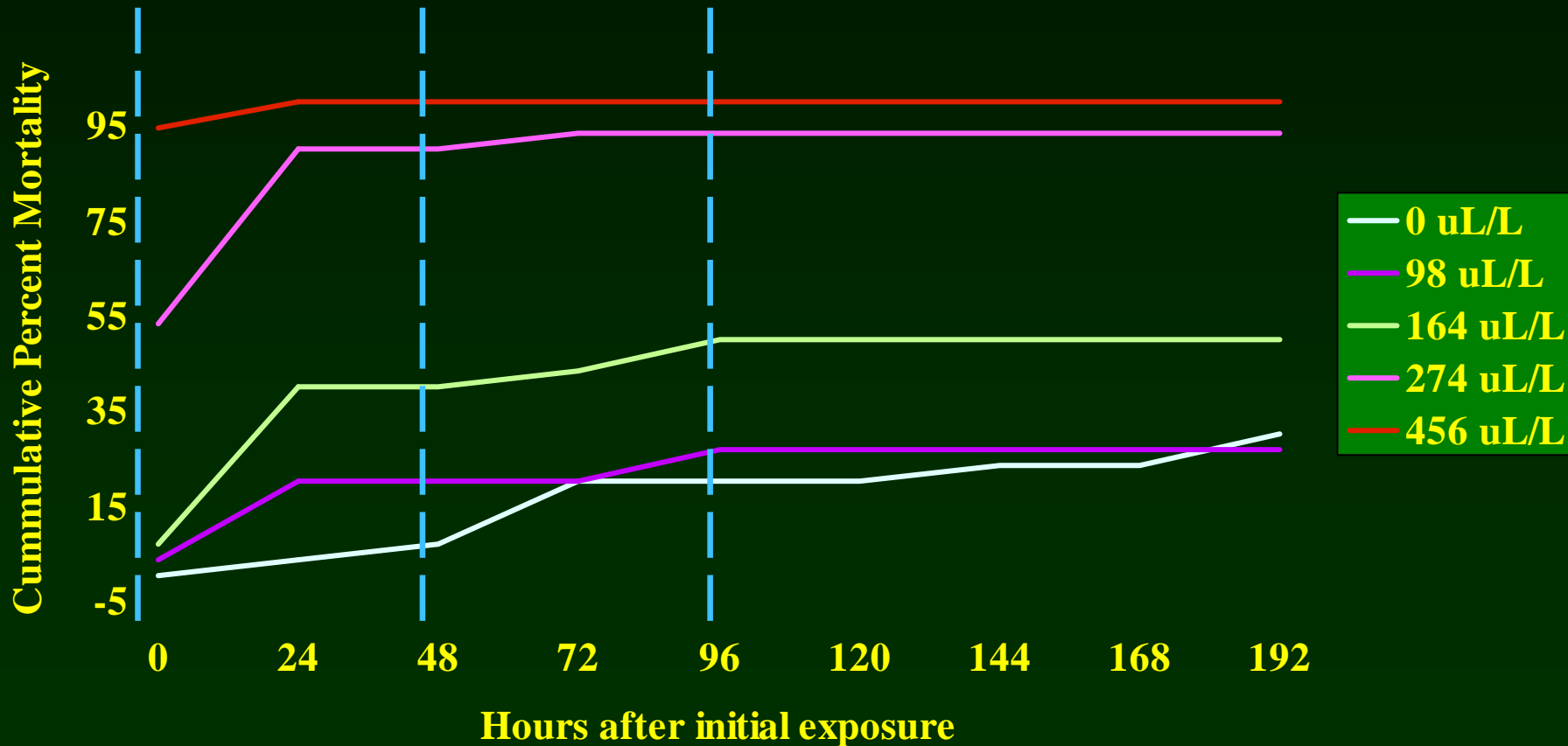
mean TL - 182 mm



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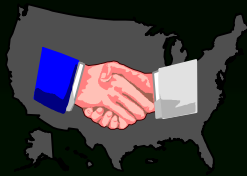
A project of the International Association of Fish and Wildlife Agencies

Results - Northern Pike Fry



mean weight - 0.32 g/fish

mean TL - 39 mm

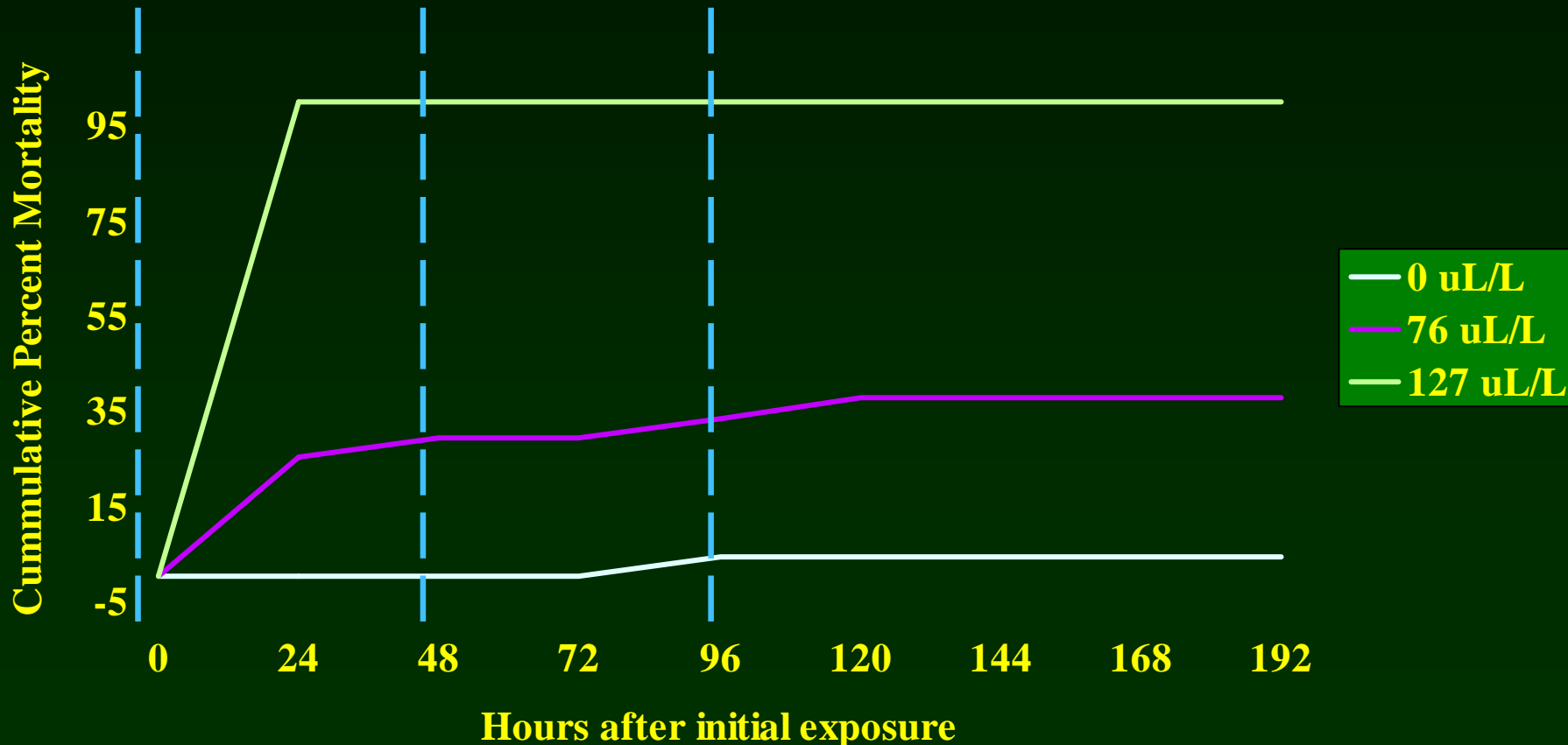


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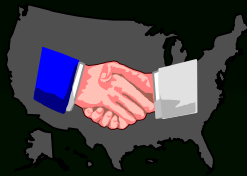


Results - Northern Pike Fingerling



mean weight - 7.23 g/fish

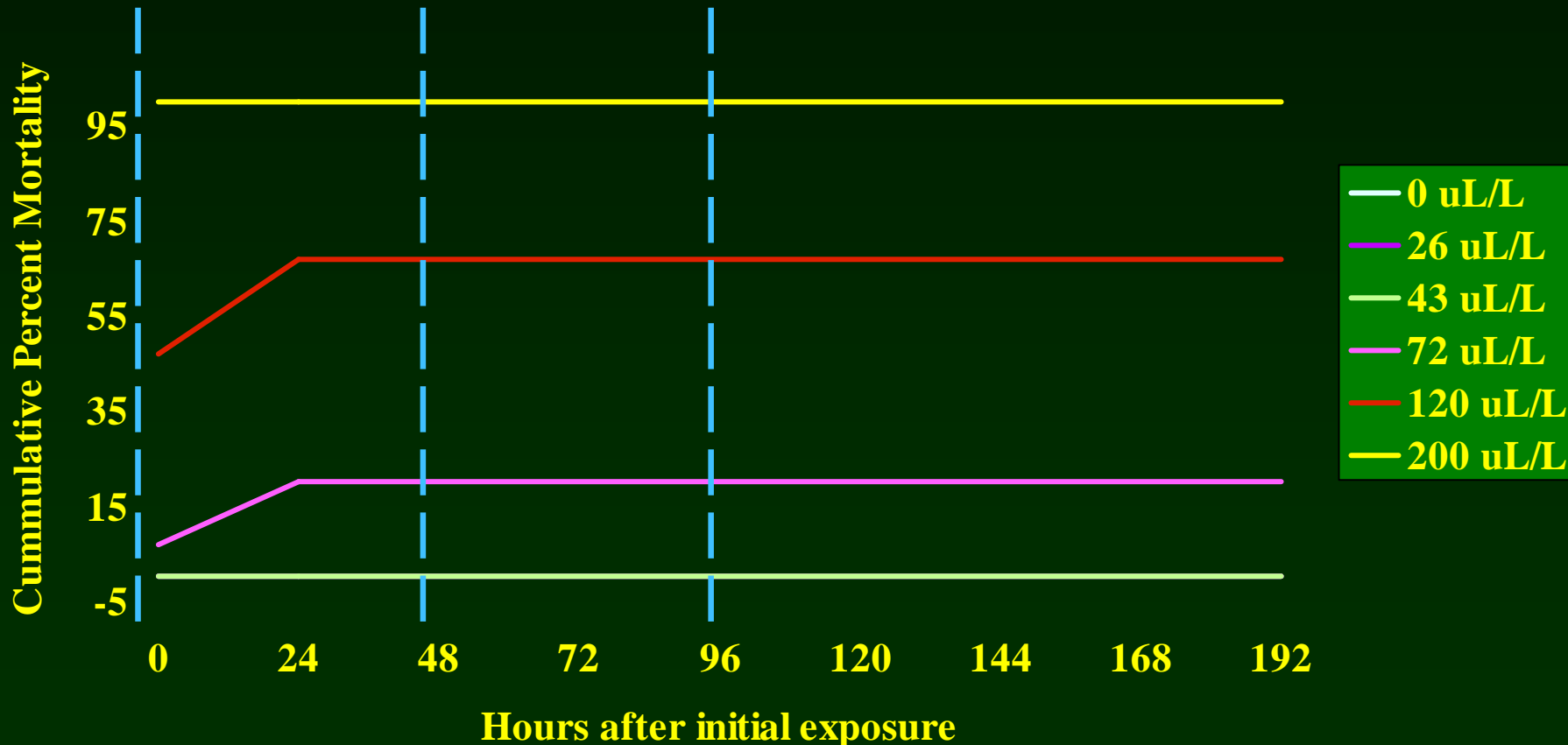
mean TL - 105 mm



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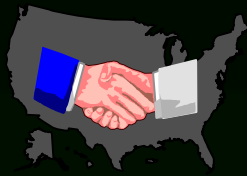
A project of the International Association of Fish and Wildlife Agencies

Results - Walleye Fry



mean weight - 0.39 g/fish

mean TL - 36 mm

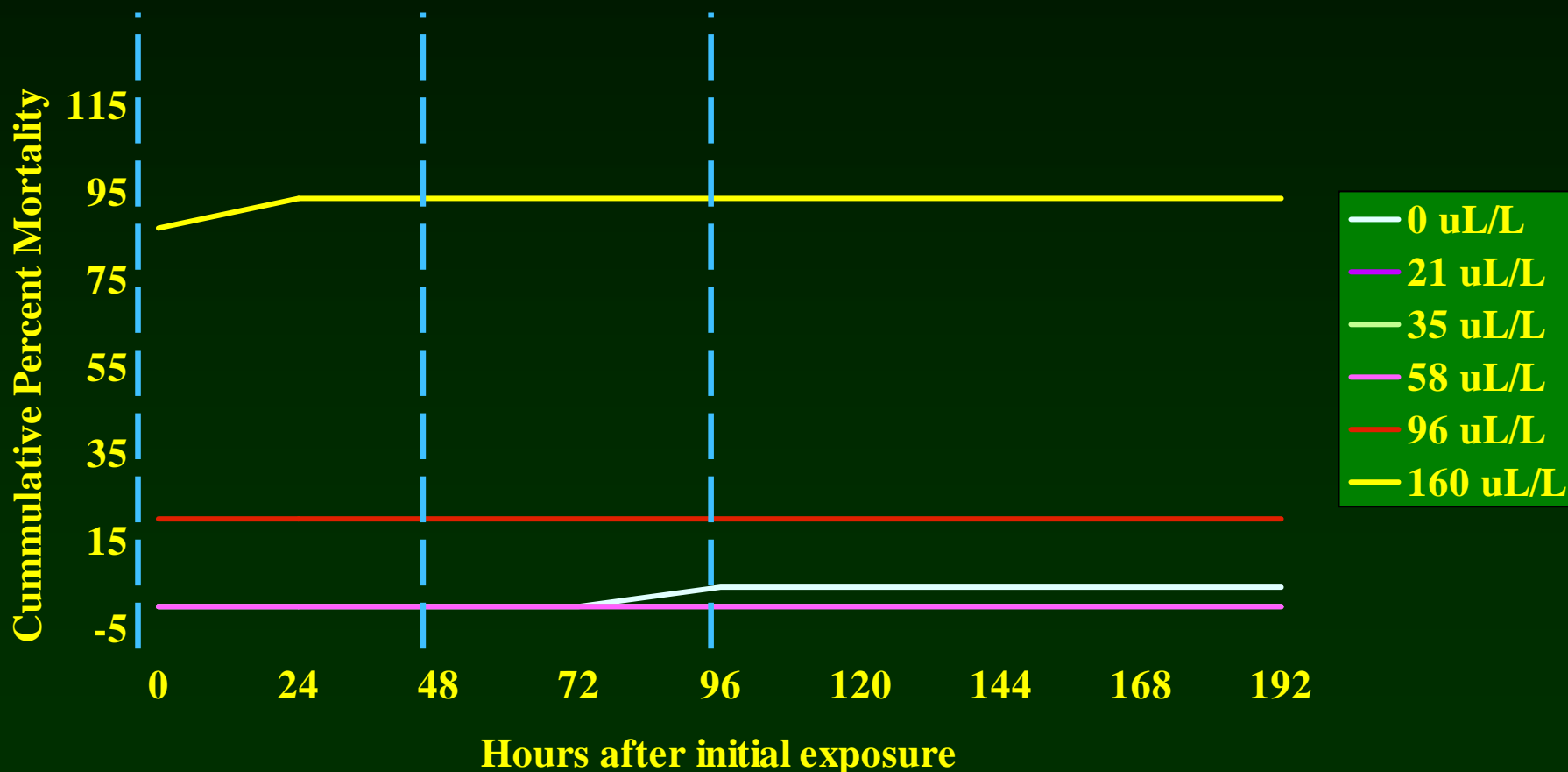


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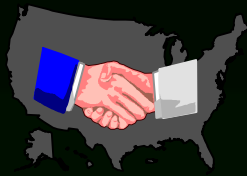


Results - Walleye Fingerlings



mean weight - 6.02 g/fish

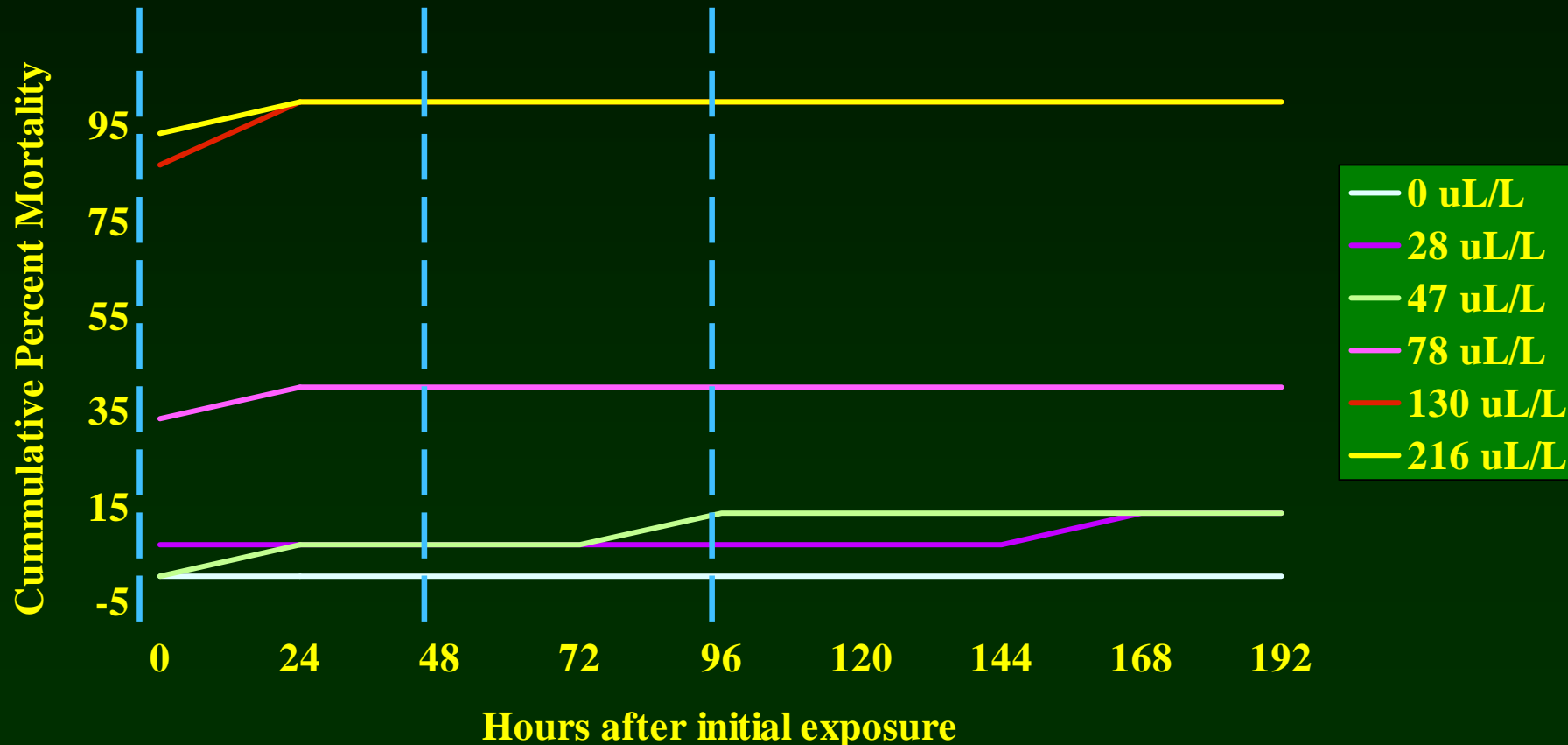
mean TL - 94 mm



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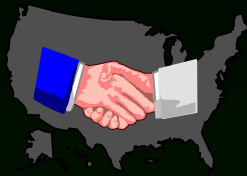
A project of the International Association of Fish and Wildlife Agencies

Results - Yellow Perch Fry



mean weight - 0.58 g/fish

mean TL - 36 mm

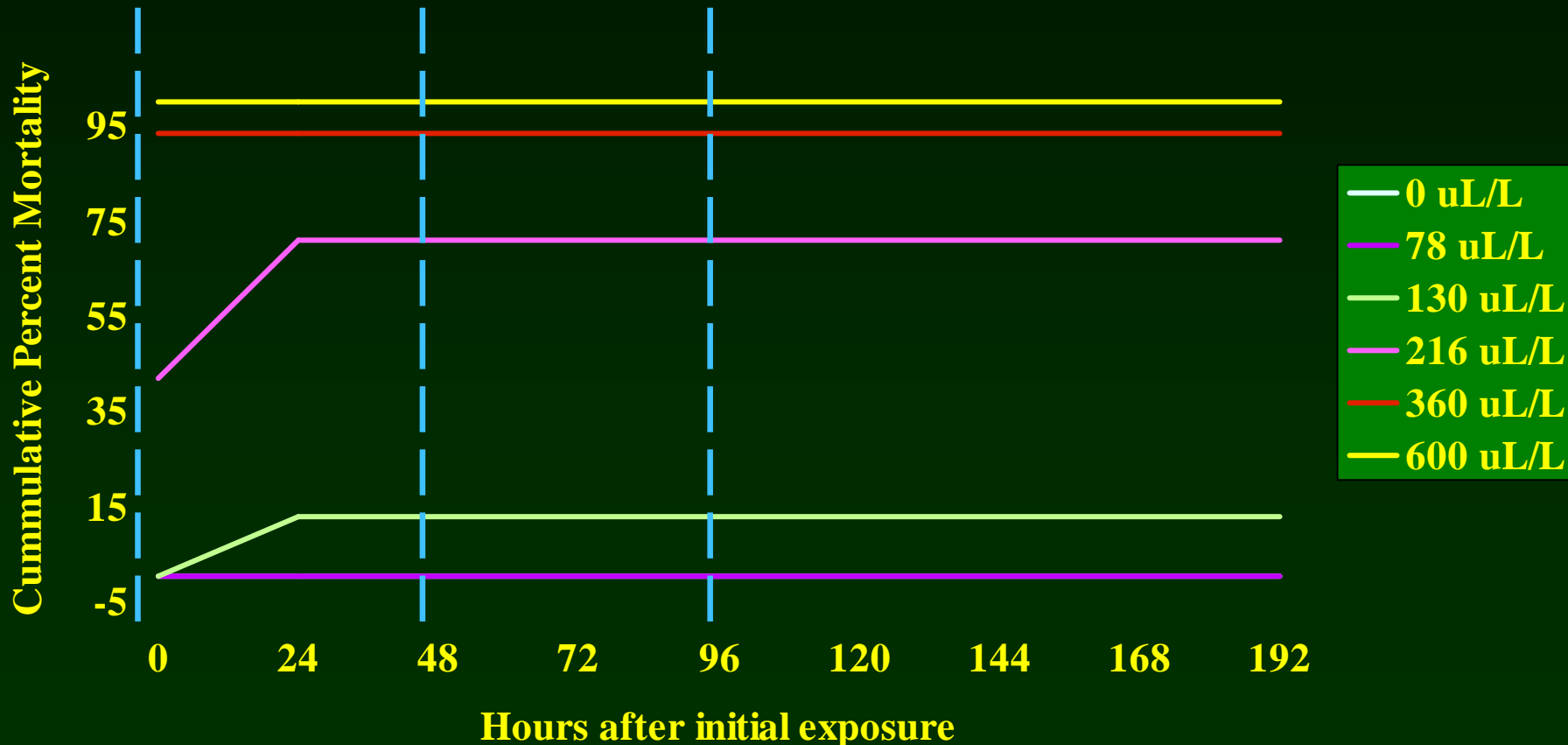


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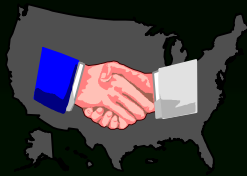


Results - Yellow Perch Fingerling



mean weight - 4.83 g/fish

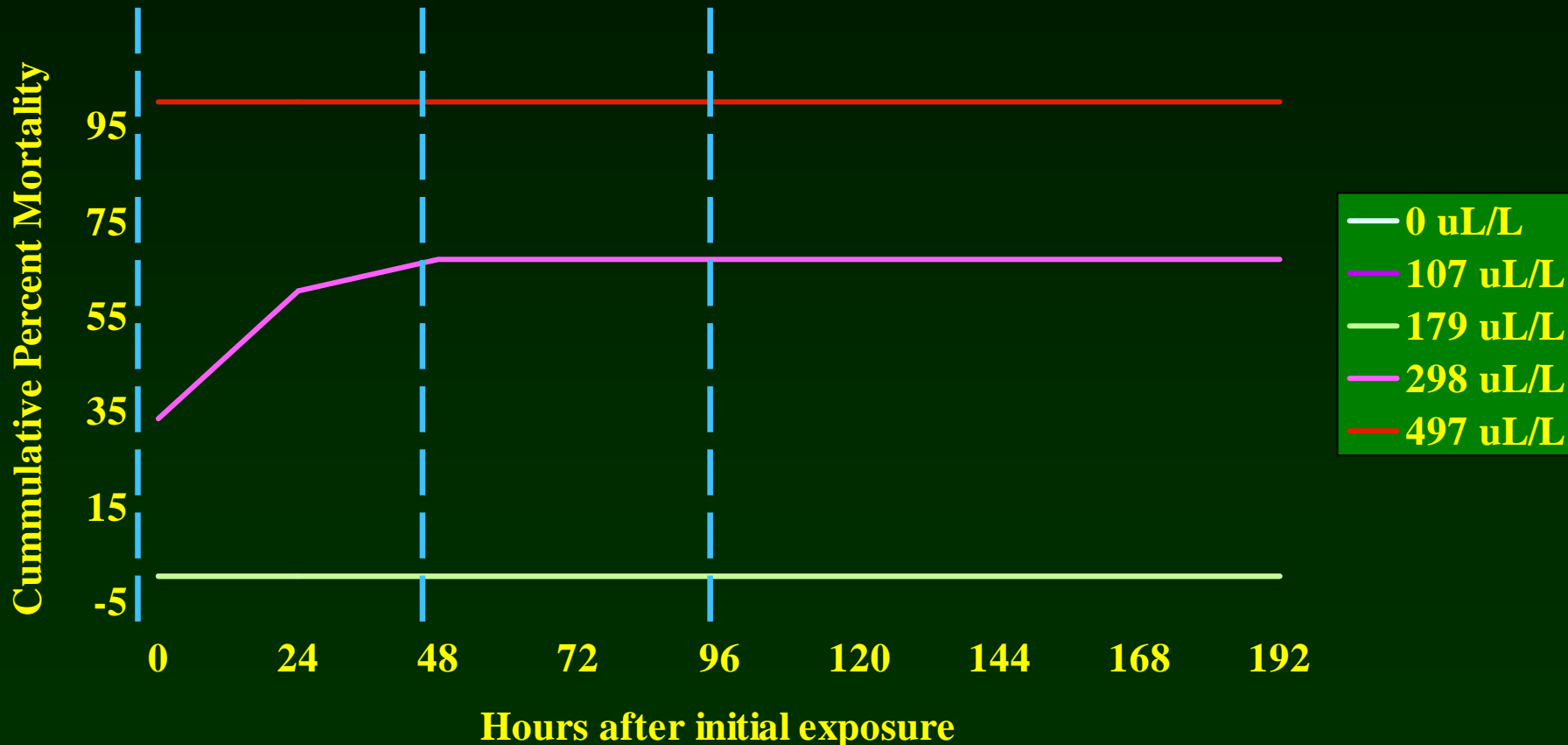
mean TL - 78 mm



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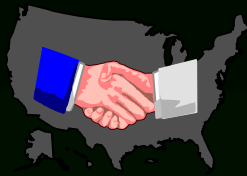
A project of the International Association of Fish and Wildlife Agencies

Results - Largemouth Bass Fry



mean weight - 0.91 g/fish

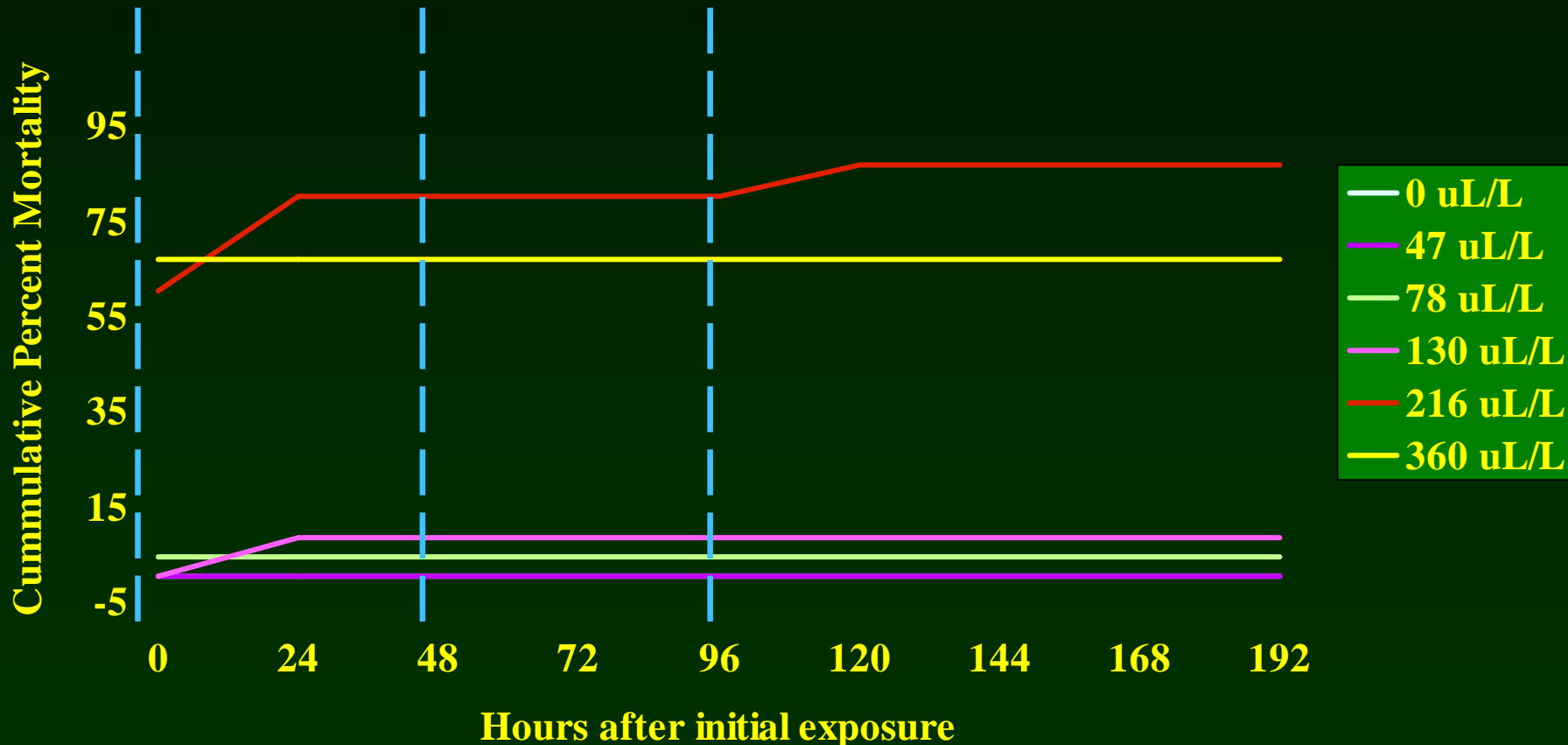
mean TL - 40 mm



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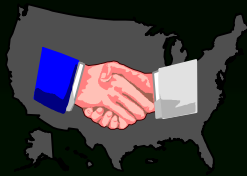
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Results - Largemouth Bass Fingerling



mean weight - 5.81 g/fish

mean TL - 77 mm

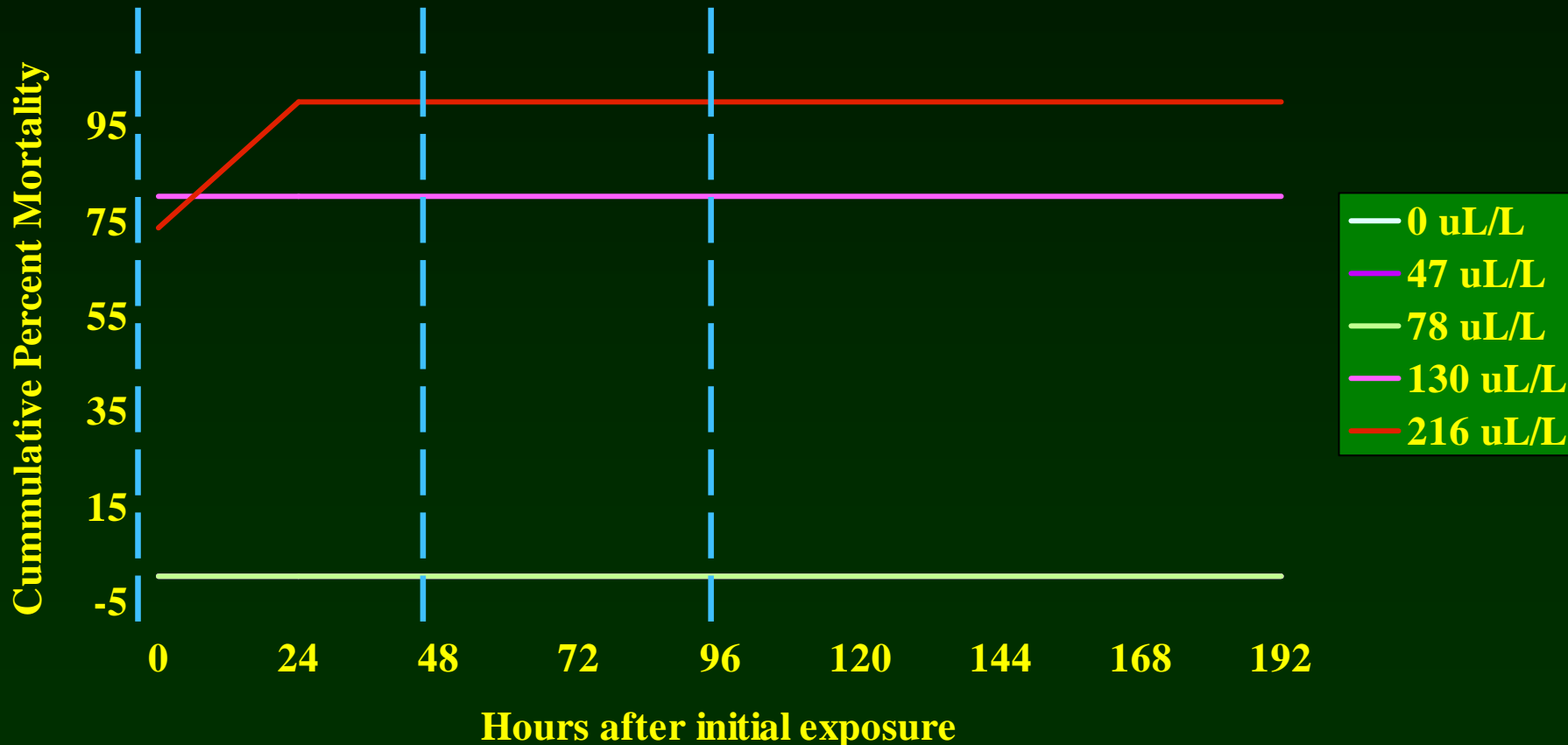


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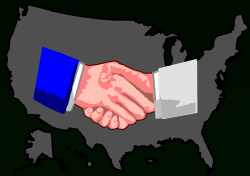


Results - Bluegill Fry



mean weight - 0.20 g/fish

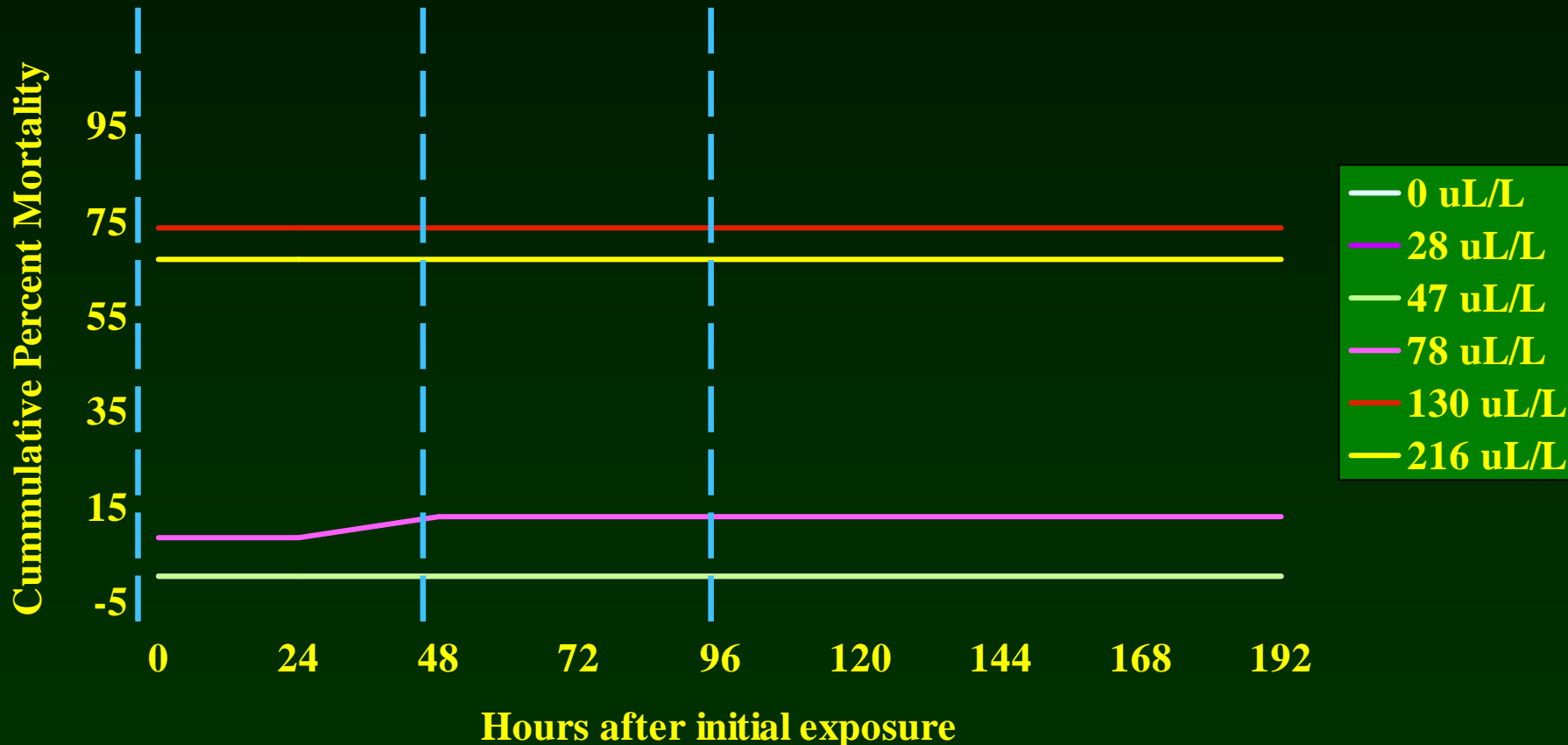
mean TL - 25 mm



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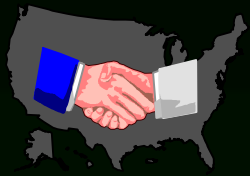
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Results - Bluegill Fingerling



mean weight - 1.07 g/fish

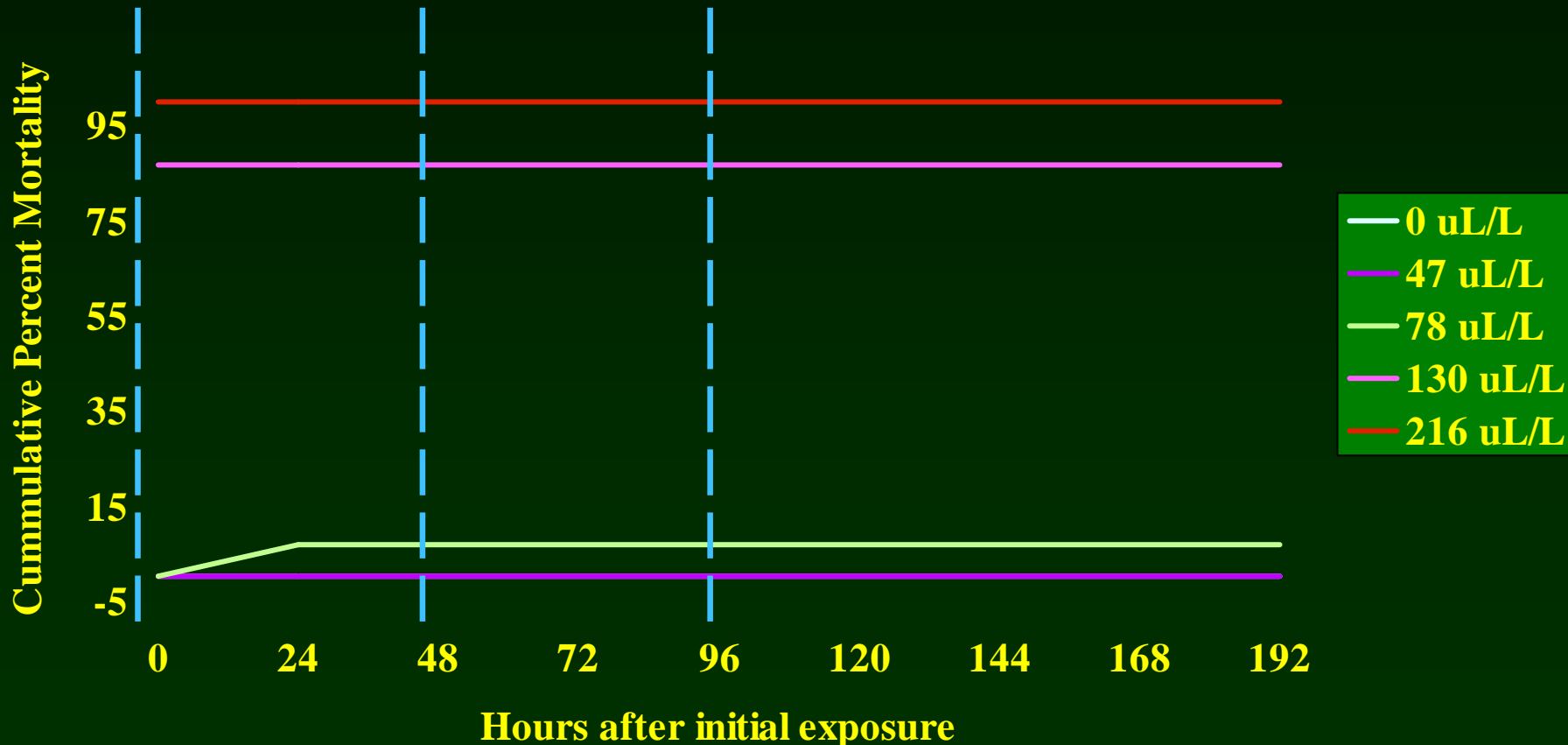
mean TL - 42 mm



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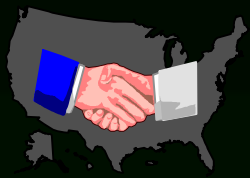
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Results - Channel Catfish Fry



mean weight - 0.62 g/fish

mean TL - 42 mm



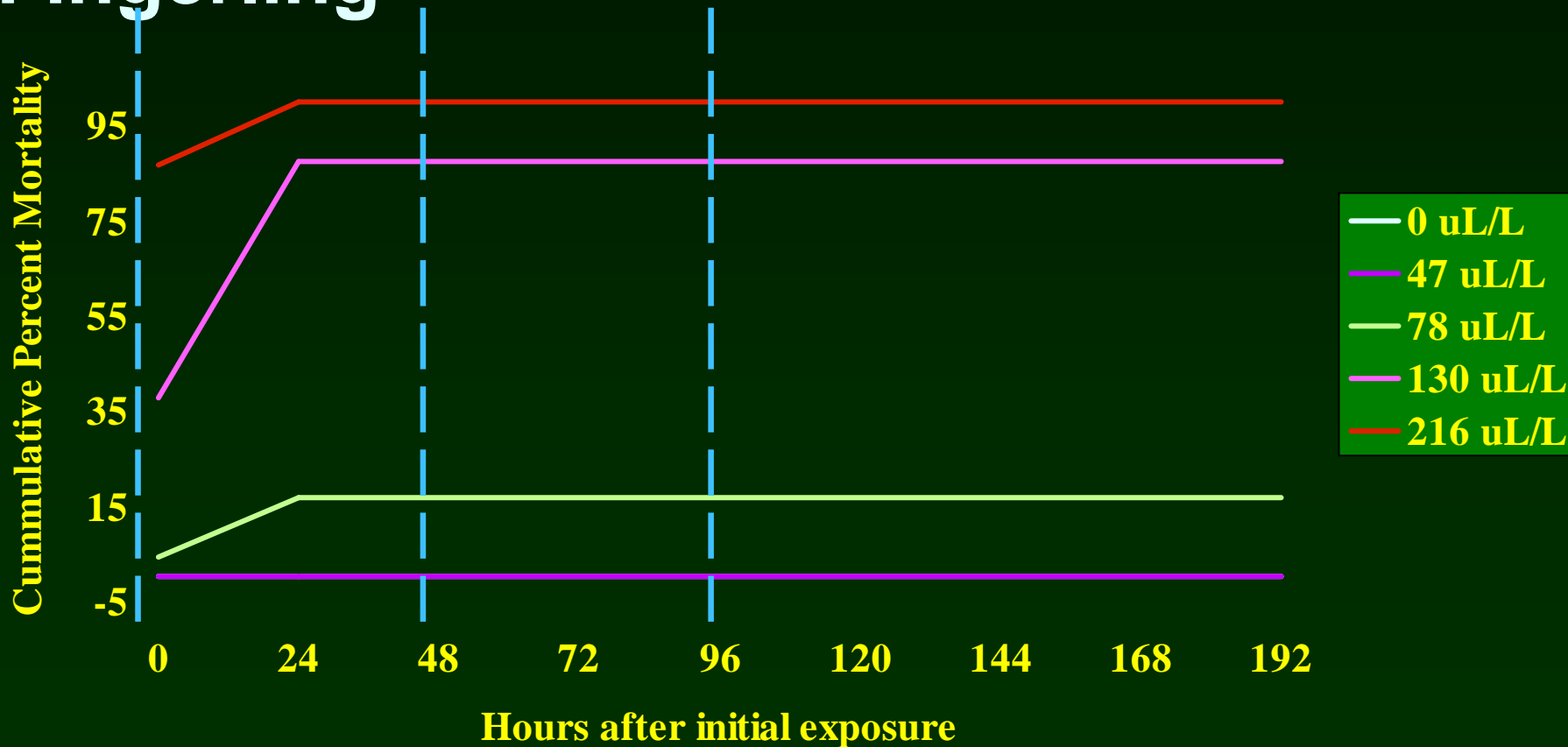
Federal State Drug Approval Partnership

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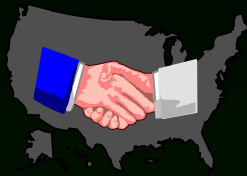
Results - Channel Catfish

Fingerling



mean weight - 4.32 g/fish

mean TL - 85 mm



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No Observed Effect Concentration (NOEC)

	NOEC	(uL/L)	Test
Species	Fry	Fingerling	Temperature (°C)
Atlantic salmon		C 221 / 120	12
Bluegill	B 78 / 47	B 47 / 47	22, 22
Channel catfish	B 47 / 28	B 47 / 28	22, 22
Fathead minnow	A 47 / 28	B 47 / 47	22, 22
Lake trout		C 298 / 68	12
Largemouth bass	C 179 / 91	C 78 / 47	22, 22
Muskellunge	C 104 / 54	C 104 / 78	17, 17
Northern pike	B 98 / 54	A 76 / 32	12, 17
Paddlefish		A 65	22
Pallid sturgeon	A 114 / 28	B 93 / 47	17, 17
Rainbow trout	C 188 / 78	C 162 / 81	12, 12
Walleye	B 43 / 43	B 58 / 28	17, 17
White sucker	A 47 / 28	B 78 / 47	22, 17
Yellow perch	A 47 / 15	B 78 / 78	22, 22



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Conclusions

- ◀ Most mortality occurred within 24 hours after the initial exposure.
- ◀ BLG, CCF, WAE, and YEP fry were similarly sensitive.
- ◀ ATS, LAT, RBT, LMB, and MUE were the least sensitive.
- ◀ Fry and fingerlings were similarly sensitive for most species.

